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THESIS

**ALLOCATING OVERHEAD COSTS IN A NAVY
WORKING CAPITAL FUND ENVIRONMENT: AN
ANALYSIS AND COMPARISON OF CURRENT NAVY
POLICY AND PRIVATE SECTOR PRACTICE**

by

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POLICY AND PRIVATE SECTOR PRACTICE**

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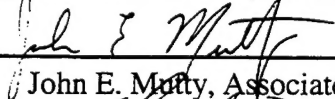
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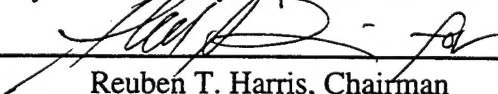
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This study found that a proposal by NAWCAD managers to reform their overhead allocation method should result in more equitable customer billing. Potential exists to improve Navy allocation practices by moving even closer to private sector practice.

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I. INTRODUCTION

A. BACKGROUND

On November 10, 1997, the Secretary of Defense announced a sweeping program to reform the business of the Department of Defense. A major goal of his Defense Reform Initiative was for the Defense department to adopt those business practices that American industry successfully used to become leaner and more flexible in order to remain competitive. With defense spending reduced in recent years, financing for the development and procurement of a new generation of weapons systems needed to maintain American military superiority into the twenty-first century must come, in large part, from savings due to increased efficiency. DOD's adoption of best business practices has produced some notable improvements in efficiency, including reengineering of its travel system, replacing "just in case" logistics with a "just in time" system, and the shift from volume printing of DOD instructions to the use of CD-ROM's and the internet. (Cohen, 1997)

Managers at Naval Air Warfare Center Aircraft Division (NAWCAD), a Navy Research, Development, Test and Evaluation (RDT&E) center, have stated that efficiency can be improved by restructuring their overhead allocation practices. (Runion, 1998) There are two aspects that make RDT&E organizations a fertile area for cost savings from improved efficiency. First, RDT&E is a large portion of defense spending. DOD

RDT&E spending totaled \$37.9 billion, or fifteen percent of total defense spending in FY98. (105th Congress 1st session, 1997).

Second, RDT&E organizations are a part of the military that are operated similarly to commercial business. Therefore, the RDT&E organizations are likely to lend themselves to adopting the lessons of commercial best business practices. The Navy has recently adopted the use of the Navy Working Capital Fund (NWCF) as the primary source of funding for its RDT&E organizations. Under this system, RDT&E organizations generate revenue from the fees charged to paying customers. These customers are primarily DOD program sponsors, but may also be non-DOD organizations that have contracts with the Navy. The goal of Navy RDT&E organizations is to generate sufficient revenue to offset total allocated costs, resulting in a zero net gain or loss at the end of a fiscal year. The NWCF terminology for net gain or loss is "net operating result" (NOR). (Haupt, 1998)

The objective of using the NWCF in Navy business type organizations is to increase the awareness of cost by holding these organizations responsible for a break-even NOR. (NAWCAD, 1998) Because overhead can constitute as much as fifty percent of an RDT&E organization's cost, the method in which overhead is allocated to cost centers and subsequently charged to customers is important to Navy managers. A poorly designed system for overhead allocation could create inaccurate and misleading cost data for RDT&E organization managers and inconsistent pricing for customers.

B. OBJECTIVE

The primary objective of this thesis is to compare the current overhead allocation practice of Navy RDT&E organizations to that used by private industry. The assumption is that competitive pressures in private industry have motivated a critical review of the treatment of overhead. In order to make informed decisions with regard to controlling costs and operating efficiently, Navy managers must be equipped with financial tools and practices that fit the nature of their business.

This thesis was developed in response to NAWCAD management's desire to explore methods that could reform their overhead allocation practices in order to better understand their organization's cost relationships and more equitably charge their customers. Representatives from the following private industries and consulting firms were interviewed for development of a private industry overhead allocation process: Allied Signal, Arthur Anderson, GTE, Kodak, and KPMG.

C. RESEARCH QUESTIONS

1. Primary

Can the method for allocating overhead costs in a Navy RDT&E organization be improved by studying the practices of the private sector?

2. Secondary

(1) Are there commonalities in the overhead allocation practices of private industry that can be developed into a common private sector process?

(2) Can a private sector practice be applied to Navy RDT&E organizations?

(3) What potential problems might result from incorporating an allocation method that is developed from the private sector?

D. SCOPE OF THESIS

This thesis will develop a process for overhead cost allocation based on the practices of leading private sector organizations and compare that process with the current practices in Navy RDT&E organizations. The scope of research is limited to information obtained from the five participating private sector organizations.

E. METHODOLOGY

The methodology used for this research was divided into the following steps:

(1) Review of the current overhead cost allocation process at NAWCAD: Interviews with NAWCAD comptroller personnel and a review of NAWC instructions and publications were the source of information.

(2) Collection of data from selected private sector organizations: Semi-structured interviews were conducted with representatives from private sector organizations to identify overhead allocation practices.

(3) Data analysis: The data were reviewed and compared for commonalties and discrepancies.

(4) Process development: Based on the data analysis, a process schematic of private sector overhead allocation practices was developed that can be applied to the Navy RDT&E environment.

(5) Process application: Private sector practice was applied to the NAWCAD organization for evaluation of the current system and potential improvements.

II. NAWCAD ORGANIZATION

A. OVERVIEW OF NAWCAD ORGANIZATION

The Naval Air Warfare Center Aircraft Division (NAWCAD), headquartered in Patuxent River, Maryland, is the Navy's full-spectrum research, development, test and evaluation (RDT&E), engineering and fleet support center for air platforms. NAWCAD, along with the Naval Air Warfare Center Weapons Division (NAWCWD), headquartered in China Lake, California, make up the two Product Divisions of Naval Air Systems Command (NAVAIRSYSCOM). (Dyer, 1999)

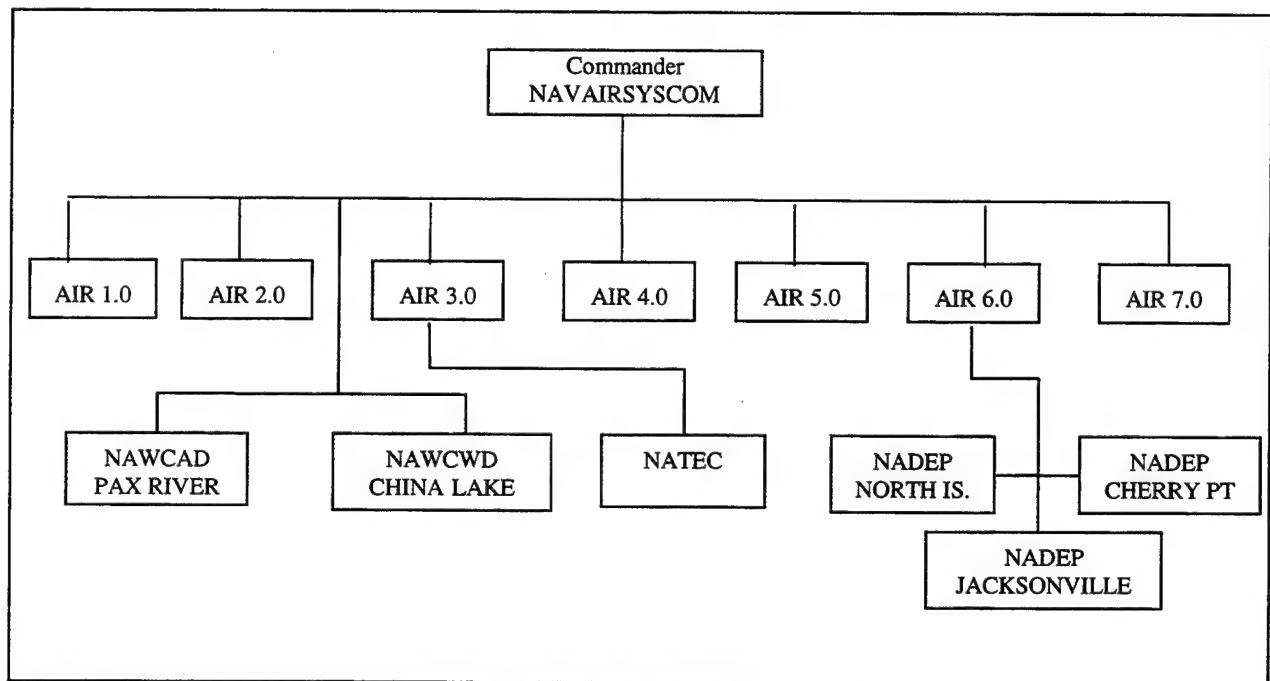


Figure 2.1 NAWCAD Chain of Command

The primary mission of NAWCAD is to support RDT&E, engineering, and fleet support of Navy and Marine Corps air vehicle systems and trainers. NAWCAD facilities include ranges, test facilities, laboratories, and aircraft necessary to support Naval Aviation acquisition requirements. NAWCAD facilities are physically located at three sites: Patuxent River, Maryland, Lakehurst, New Jersey, and Orlando, Florida. (Dyer, 1999)

1. NAWCAD Competencies

NAWCAD is organized as a Competency Aligned Organization/Integrated Program Team (CAO/IPT). Under CAO/IPT, the organization is aligned by function into seven competencies: Program Management, Contracts, Logistics, Research and Engineering, Test and Evaluation, Corporate Operations, and Shore Station Management. (Dyer, 1999)

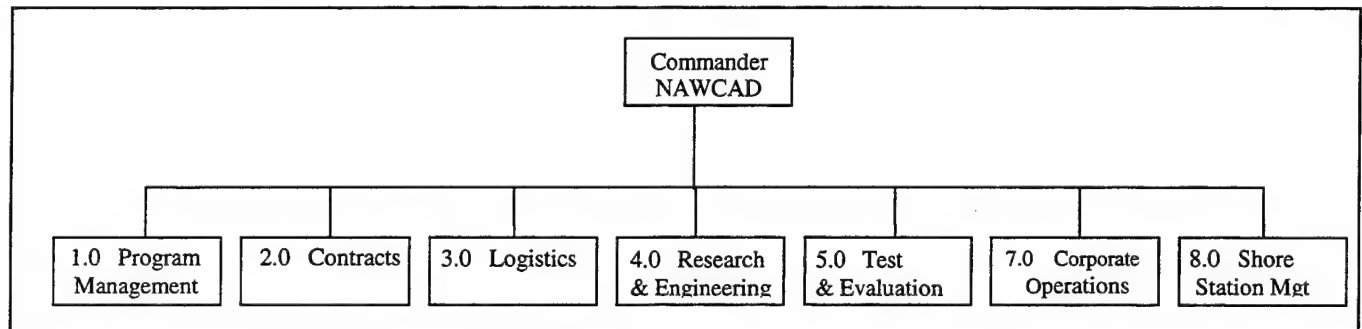


Figure 2.2 NAWCAD Organization

NAWCAD competencies are further organized into three levels of sub-competencies. Sub-competencies are categorized as Level I, Level II, and Level III in descending order in the organizational structure. For example, Competency 4.0

(Research and Engineering) has ten Level I sub-competencies which are designated 4.1, 4.2, 4.3, etc. Level I sub-competencies are generally laboratories, test centers, or business functions grouped by mission area. Level I sub-competencies are further divided into Level II sub-competencies by functional category that support the Level I mission requirements. For example, Level I sub-competency 4.6 (Crew Systems) is further subdivided into four Level II categories 4.6.1, 4.6.2, 4.6.3, and 4.6.4. Finally Level II sub-competencies are further divided into Level III sub-competencies which are individual laboratories, test centers, or business workcenters. For example, Level II sub-competency 4.6.1 (Systems Engineering) is further divided into three individual laboratories designated 4.6.1.1, 4.6.1.2, and 4.6.1.3. Figure 2.3 is an example of a Level I sub-competency broken down into Level II and Level III sub-competencies.

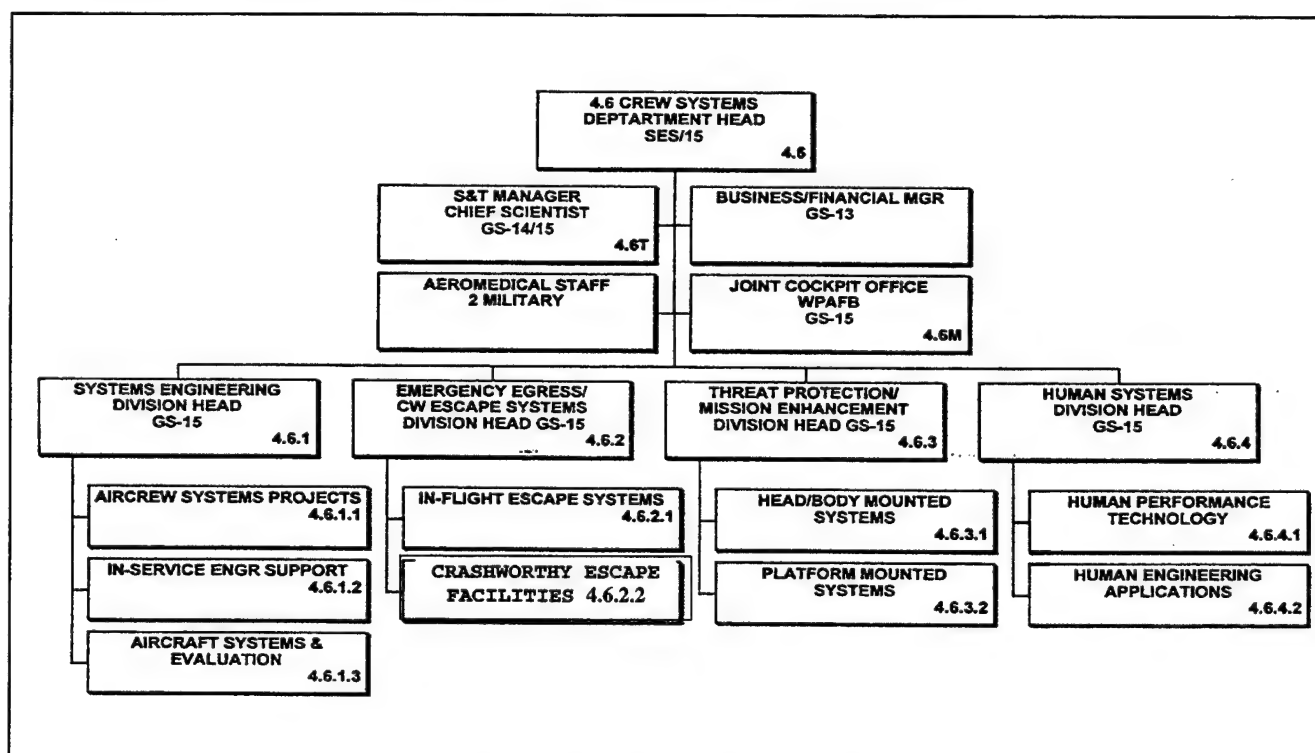


Figure 2.3 NAWCAD Sub-competency

B. ACCOUNTING AND FINANCIAL MANAGEMENT SYSTEM

1. Navy Working Capital Fund Overview

NAWCAD funds the majority of its activities through the Navy Working Capital Fund (NWCF). As discussed previously, under the NWCF system, NAWCAD operations are initially financed using the NWCF corpus and then are reimbursed by billing customers' appropriated program funds using predetermined stabilized rates. The revenue generated finances all activity operations, including overhead costs. As illustrated in Figure 2.4, the NWCF cycle begins with a customer order received by a

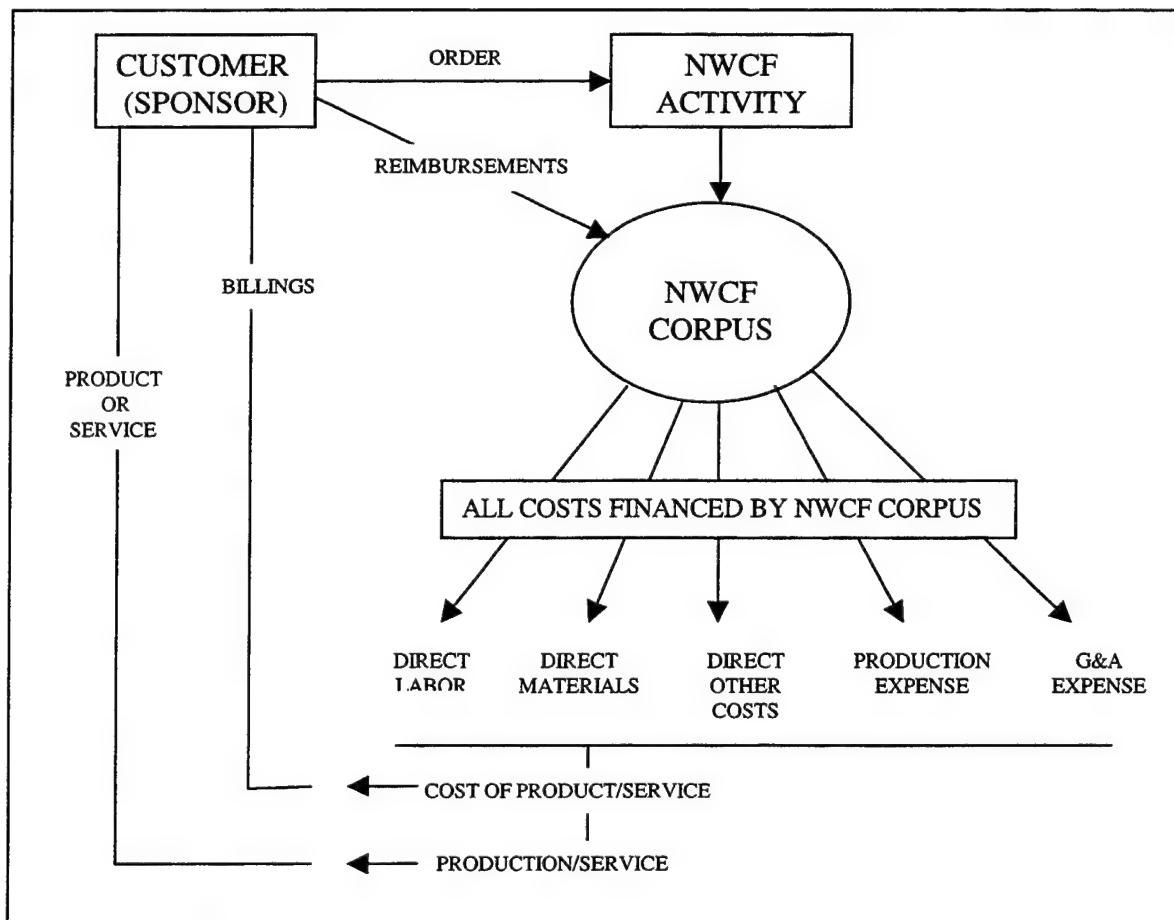


Figure 2.4 NWCF Cycle

NWCF activity. The NWCF activity finances all direct and indirect costs to produce a product or service through the NWCF corpus. The product or service is then delivered to the customer along with the associated billing. The cycle is completed when the customer pays the bill by reimbursing the NWCF corpus. (Naval Aviation Systems Team, 1998)

NAWCAD, as with all NWCF activities, is expected to generate sufficient revenue through customer billings to offset total operating costs. Some NAWCAD activities do receive appropriated Major Range and Test Facility Base (MRTFB) funds. MRTFB funds are provided to supplement federal RDT&E activities determined by Congress to be critical DOD or national assets. In FY98, approximately twenty-five percent of NAWCAD costs were funded through MRTFB appropriated funds. (NAWCAD, 1999) However, the NWCF is the primary source of funding at NAWCAD and likely will continue to be so in the future. (Runion, 1998) Presently, all 4.0 competency laboratories operate solely under the NWCF and receive no MRTFB funding. Only Competency 5.0 has MRTFB funding. In keeping with the Defense Reform Initiative, the trend appears to be for more and more RDT&E facilities to adopt the full-costing approach accomplished by using the working capital fund. (Runion, 1998)

As discussed previously, the goal of a NWCF organization is to achieve a zero Net Operating Result (NOR), defined as total revenue minus total cost. Billing customers at a predetermined rate based on direct labor hours generates revenue. Because revenue is dependent on the stabilized billing rate charged to customers, the formulation of rates is extremely important.

2. Rate Formulation at NAWCAD

The following discussion of rate formulation is a simplified version of a much more complicated and lengthy process. This study concentrates on the aspects of overhead allocation that can be analyzed without a detailed description of the entire rate formulation process that includes budget submission to Navy FMB, OSD, and Congress.

The comptroller of a NWCF activity is responsible for computation of stabilized customer billing rates and determination of overhead rates. Final approval of the activity's budget prior to submission to the management command is the responsibility of the Commanding Officer. (U.S. Navy Office of the Comptroller, 1990) At NAWCAD, rate formulation begins with the submission of upcoming year budgets by the competencies. Competency annual budgets include anticipated direct labor hours for civilian government and military personnel, estimated direct costs, and estimated overhead costs. (Dean, 1999) Overhead is categorized as either production overhead or general and administrative (G&A) overhead. Production overhead is defined as expenses incurred by direct (production) cost centers that cannot be readily identified to a specific customer order (i.e., office equipment, training, travel, utilities, equipment maintenance). (U.S. Navy Office of the Comptroller, 1990) Direct cost centers at NAWCAD that incur production overhead are competencies 1.0 Program Management, 3.0 Logistics, 4.0 Research and Engineering, and 5.0 Test and Evaluation. G&A overhead is defined as costs incurred that are of an indirect nature which support the entire activity and cannot be identified to a direct program or production cost center. Competencies whose overhead is exclusively general and administrative (no production overhead) are called

general cost centers. General cost centers at NAWCAD include competencies 2.0 Contracts, 7.0 Corporate Operations, and 8.0 Shore Station Management. (Dyer, 1999)

The NAWCAD comptroller uses the information from the competency budgets to develop customer billing rates for the coming year. The rate consists of a stabilized direct labor rate, plus a production overhead rate (for direct cost centers only), plus a G&A overhead rate (for all competencies). Figure 2.5 shows the calculation used to determine the direct labor rate for a given competency.

Total Direct Salary Dollars (Gov. Civilian & Military)					
	X	Acceleration Factor	=	Direct Labor	
Total Direct Labor Hours (Gov. Civilian & Military)				Rate (\$/Hr.)	

Figure 2.5 Direct Labor Rate

The acceleration factor in Figure 2.5 is used to increase (accelerate) the direct labor rate to cover expenses such as anticipated personnel leave and government share of personnel benefits.

The next calculation is required for production cost centers. A production overhead rate is added to the direct labor rate in production cost centers only. Figure 2.6 shows the calculation used to determine the production overhead rate for a given direct cost center.¹

¹ A production overhead rate for specific professional specialties (e.g., secretarial, technical) is developed for each direct competency.

$\frac{\text{Tot. Est. Production Ovhd. (Dollars)}}{\text{Tot. Est. Direct Labor Hours}}$	=	$\frac{\text{Production Overhead Rate}}{\text{Rate (\$/Hr.)}}$
---	---	--

Figure 2.6 Production
Overhead Rate Calculation

At NAWCAD production overhead is pooled at the competency level, and each of the four production competencies has a different rate. As discussed previously, only production competencies charge customers the production overhead rate.

The final rate calculation required for customer billing is for a G&A overhead rate, which is charged by all competencies. Figure 2.7 shows the calculation used to determine the G&A overhead rate.

$\frac{\text{Tot. Est. G\&A Ovhd. (Dollars)}}{\text{Tot. Est. Direct Labor Hours}}$	=	$\frac{\text{G\&A Overhead Rate}}{\text{Rate (\$/Hr.)}}$
---	---	--

Figure 2.7 G&A Overhead
Rate Calculation

Once the billing rates have been calculated by the comptroller and reviewed by NAWCAD managers from all the competencies, they are forwarded to the Commanding Officer for approval. Approved rates become the stabilized billing rates charged to NAWCAD customers for the coming fiscal year. (Dean, 1999) Figure 2.8 is an example of a production cost center stabilized rate. Figure 2.9 is an example of a general cost center stabilized rate.

Average hourly rate	\$29.10
Acceleration of labor for anticipated and government share of benefits	x 1.46
—	
◆ NAWCAD FY98 Accelerated Direct Labor Rate Product	\$42.49
◆ Production Overhead	\$10.73
◆ G & A Overhead	<u>\$28.95</u>
The Customer is Billed Stabilized Rate	<u>\$82.17</u>

Figure 2.8 Production Stabilized Rate

Average hourly rate	\$24.30
Acceleration of labor for anticipated leave and government share of benefits	x 1.46
—	
◆ NAWCAD FY98 Accelerated Direct Labor Rate	\$35.48
◆ Production Overhead	\$ N/A
◆ G&A Overhead	<u>\$28.95</u>
The Customer is Billed Stabilized Rate	<u>\$64.43</u>

Figure 2.9 G&A Stabilized Rate

Under this billing system, NAWCAD covers (or intends to cover) all indirect costs by billing customers based on direct labor hours of government civilians and military personnel (organic personnel) who work on customer work orders.

At the end of the fiscal year, actual total costs are subtracted from actual total revenues, resulting in a zero, negative, or positive NOR. A negative balance must be

added to the total costs for the following year resulting in higher rates. A positive balance results in lower rates the following year. (Runion, 1998)

NAWCAD's financial management process is consistent with guidance contained in the Navy Comptroller Manual and the DOD Financial Management Regulations. The NAVCOMPT Manual specifically states that "overhead costs will be applied to jobs by using predetermined overhead rates based on total civilian and military direct labor hours". (U.S. Navy Office of the Comptroller, 1990, p.1-35) It also states that overhead rates are designed for the sole purpose of recovering all overhead expenses. (U.S. Navy Office of the Comptroller, 1990, p. 2-31)

C. NAWCAD COMPOSITE RATE STUDY

A recent trend towards an increased use of non-government contract personnel in NAWCAD laboratories and facilities has prompted NAWCAD financial managers to question the use of organic direct labor hours as the sole basis of overhead recovery. Currently, there is no vehicle in place that allocates overhead based on a use of contract labor. Customer programs that use a preponderance of contract personnel pay for relatively less overhead than those programs that use mostly government personnel. NAWCAD managers say that some overhead costs support government as well as contract personnel, and therefore using government direct labor hours as the sole basis for allocation creates inequitable billing rates. (Runion, 1998) This apparently inequitable distribution of overhead charged to customers is the basis for NAWCAD's Composite

Rate Study, that proposes a method for recovering overhead that is more flexible to a changing workforce mix. (NAWCAD, 1998)

The NAWCAD Composite Rate Study groups overhead into three overhead cost pools: government indirect costs, occupancy costs, and general and administrative costs. The government indirect cost pool consists of overhead costs associated with government employees. The occupancy cost pool comprises overhead costs associated with occupying space in NAWCAD facilities. The general and administrative cost pool is made up of costs associated with operating NAWCAD and benefiting all employed by the activity. (NAWCAD, 1998) Figure 2.10 depicts the overhead cost pools. Examples of

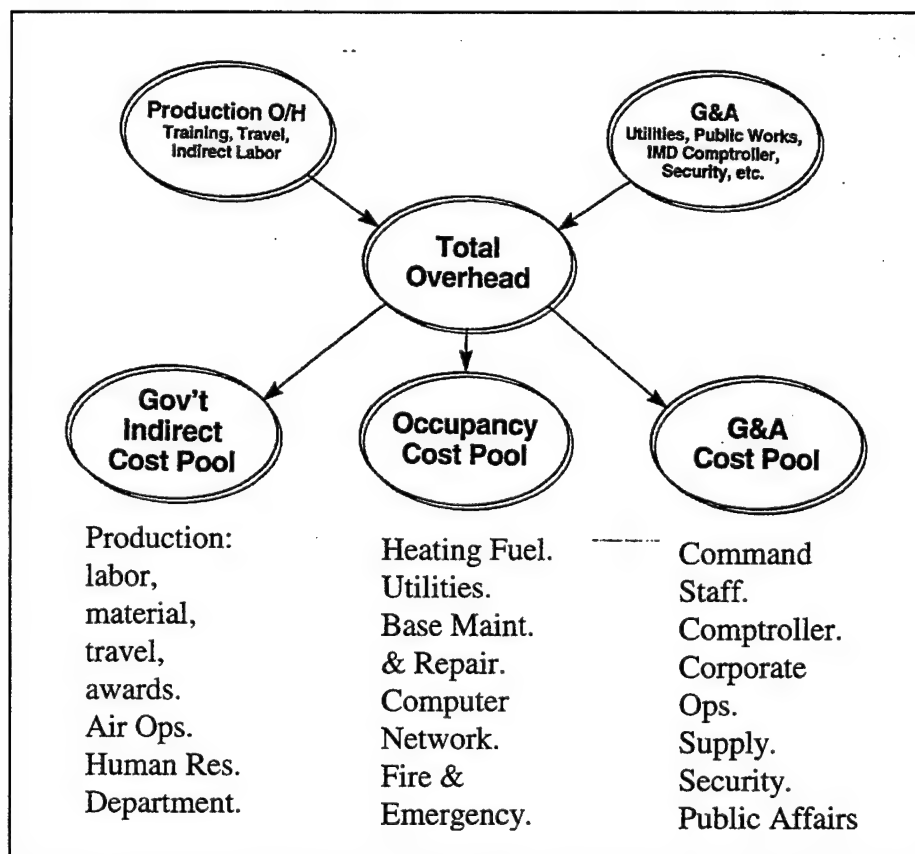


Figure 2.10 NAWCAD Prototype Overhead Cost Pools
From NAWCAD, 1998

costs contained in the three cost pools are listed under the respective cost pools.

The proposed method for recovery of overhead cost pools is intended to associate cost with benefit. The government indirect costs are recovered through an hourly rate applied to direct government hours (military and civilian). Occupancy costs are recovered through an hourly rate applied to direct, on-site government, and on-site contractor hours. G&A costs are not recovered using labor hours as a basis. Instead, a G&A percentage of total costs is calculated, and this calculated percentage is added to all costs. For example, if G&A costs are calculated to be 7 percent of total NAWCAD costs, a 7 percent "surcharge" is added to all costs charged to customers in order to recover G&A overhead costs. The composite rate proposal is not intended to have an affect on total cost and revenue, or the resulting NOR. Its stated purpose is to more equitably distribute overhead costs to customers. (Runion, 1998)

III. PRIVATE SECTOR OVERHEAD ALLOCATION ANALYSIS

A. COLLECTION OF DATA

This section describes the method used to gather data regarding overhead allocation practices in private sector organizations and presents commonalities and lessons learned. Representatives from five private sector organizations agreed to provide information for this work: Allied Signal, Arthur Anderson, GTE, Kodak, and KPMG. At the request of the private sector participants, no data or specific practices will be attributed to a particular organization. The interpretation of common practices among participants is the perspective of the author, and should not be associated with any specific firm.

Interviews with financial managers in the organizations were done both face-to-face and through the use of e-mail. Initial interview questions were designed to collect data concerning the general methods used to allocate overhead in the organizations. Questions concerning make or buy decisions and transfer pricing were included for their potential in drawing comparisons with outsourcing decisions in the DOD environment. Face-to-face interviews were used to clarify and expand organizational allocation methodology and to gather other private industry lessons learned.

B. SUMMARY OF INTERVIEWS

1. Informal Interview Written Responses

The following questions were forwarded to financial managers of the private sector organizations. Initial correspondence with the organizations was with a single point of contact. Four of the five managers acting as points of contact subsequently consulted with other managers in their organization to answer the questions. The manager from the fifth participating organization is a consultant. His answers were based on his observations of the allocation practices of his clients. All responses were received via e-mail within thirty days of request. The answers are based on a synthesis of the written responses from all five organizations.

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: All but one response were between ten and fifteen percent. One company's G&A overhead was twenty-five percent of total cost. G&A overhead as a percentage of total cost by company is summarized below:

Company A: 25%
Company B: 11%
Company C: 10%
Company D: 10-15%
Company E: 15%

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: All companies allocate all of their G&A overhead to profit centers.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: As might be expected, there were a variety of different bases used to allocate overhead costs. All companies use more than one allocation base. Some general agreement in determining appropriate allocation bases were:

- (1) All companies try to use overhead allocation bases that tie cost to cause or benefit.
- (2) The objective of overhead allocation is an important factor in determining allocation bases. Some of the overhead allocation objectives cited by the managers were product pricing, performance evaluation, and financial reporting.
- (3) The number of allocation bases should be the minimum number necessary to accomplish the objective.

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: All responded that obtaining goods and services from an outside source is permitted even though available from within the corporation.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: The consensus was that make or buy decisions are not made solely on price. Three out of five organizations stated that other factors in addition to price were considered in make or buy decisions. One company encourages internal buying, but did not state specific criteria other than price. One company stated that low price “generally wins” in the make or buy decision. While competitive pricing is a major determining factor, financial managers should be aware that there are many different ways to evaluate the “true” cost to make a product and that buying a product does not necessarily eliminate all costs allocated to the previously organic product. Factors other than price that were cited as relevant to the make or buy decision were quality, support, risk, and reliability of the supplier.

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: All companies commented that the issue of how to treat contract labor with respect to overhead allocation has been a difficult area. Four of the five organizations now allocate a reduced amount of overhead based on either contractor “head count” or labor hours. The reduced amount of overhead comes from a cost pool that consists of costs that have a reasonable causal relationship with on-site contractors.

2. Additional Private Industry Lessons Learned

After reviewing the written responses, face-to-face interviews were conducted with representatives from the five private sector organizations. Twelve managers were interviewed over a three-day period. Duration of the interviews ranged from thirty to ninety minutes. Discussions included clarification and expansion of ideas in the written responses as well as overhead allocation lessons learned by the participating organizations. Managers discussed allocation practices that their firms had used, both successfully and unsuccessfully, in the past. They also commented on their knowledge of allocation practices in other organizations. An analysis and comparison of the interviews revealed some additional private industry behaviors and practices. These have been summarized below.

(1) All financial managers interviewed feel that the foundation of an effective overhead allocation method is first establishing the corporation's objective for overhead allocation. Only after establishing an allocation objective, can allocation bases be evaluated for effectiveness. Some overhead allocation objectives that were evident from the discussion included:

- To evaluate the performance of a profit center
- To establish prices
- To identify areas for cost cutting
- To eliminate or outsource unprofitable functional areas
- For financial reporting

(2) If the objective of overhead allocation is broad and relatively non-specific, organizations tend to use only a few indirect cost pools and allocate them using one or two readily available bases. Conversely, if an organization has one or more specific, strategic allocation objectives, they are likely to develop multiple cost pools and allocation bases.

(3) In determining appropriate cost pools for indirect costs and the allocation bases, private sector organizations strive to find causal factors.² In the course of discussion, it appeared that cause and benefit as allocation criteria were referred to almost interchangeably. For clarification, to allocate based on cause means that indirect costs are allocated in proportion to factors that caused those costs. To allocate based on benefit means to allocate in proportion to the benefits a cost center receives. All of the private sector organizations in this study actually use allocation bases determined by both cause and benefit factors.

² It is important to distinguish cost allocation of indirect costs from cost tracing of direct costs. Indirect costs are costs that are related to a cost object but cannot be traced to it in an economically feasible way. (Horngren, Foster, and Datar, 1997) This discussion refers to indirect costs that have cause or benefit relationships to cost objects, but cannot be further traced in an economical way.

(4) For indirect costs that do not lend themselves to be allocated by cause or benefit bases, most of the organizations in this study use an allocation base that is predicated on fairness or equity.³

(5) Most managers interviewed agreed that production related indirect costs (i.e. machinery maintenance, utilities) were more likely to have multiple cause and benefit bases, whereas G&A overhead is more likely to be allocated based on fewer factors. This appears to be based on the argument that it becomes more difficult to apply overhead based on cause or benefit as the services become more remote from the cost objectives.

(6) An important lesson from many years of implementing and developing activity based costing (ABC) systems in the private sector is that actually doing something with the information produced is as important as having a good allocation system. The managers interviewed had experienced situations where much time, effort, and expense were being expended on overhead allocation activities, but nothing was really being done with the information. This point relates to the need for clear objectives for cost allocation.

³ Equity or fairness as a criterion for selecting an allocation base is inherently subjective in nature (Fremgen and Liao, 1981). Accounting literature also uses the term "reasonable."

(7) The last general lesson garnered from the face-to-face interviews serves as a “check and balance” for any allocation system. An overhead allocation system should not be so complicated that it creates more work and expense than the benefit it produces. The experience of private sector managers is that organizations need to consider this concept periodically to ensure they are receiving sufficient benefit from their allocation efforts.

IV. PRIVATE SECTOR OVERHEAD ALLOCATION PROCESS

A. PROCESS DEVELOPMENT

Based on the overhead allocation practices and behaviors of the private sector organizations studied, a general process for developing an overhead allocation system can be derived. The process can then be depicted in a step-by-step representation.

Step one: Identify indirect costs

By definition, indirect costs are those costs incurred for the benefit of two or more components of a company in such a way that it is difficult or impossible to trace specific portions of the costs exclusively to individual components. (Fremgen and Liao, 1981) It stands to reason that the first step in developing an overhead allocation process is the identification of all costs that are to be classified as overhead. Included in this step is the review of indirect cost data from previous years and budgeted indirect costs for the upcoming year.

Step two: Identify objectives for overhead allocation

As discussed in Chapter III, the financial managers interviewed from the private sector related that the identification of an organization's objectives for overhead allocation is critical to the development of an effective allocation process. An effective allocation process, according to the managers, is an allocation process that meets the

needs of the organization's managers. Some of the objectives for overhead allocation cited were evaluation of profit center performance, development of prices, identification of areas for cost-cutting, and financial reporting. These objectives can be categorized as either broad, easily obtainable objectives or specific, strategic objectives. For example, the allocation of indirect costs for the purpose of financial reporting is a broad, easily obtainable objective. On the other hand the allocation of indirect costs for the purpose of evaluating profit centers or product lines is a specific, strategic objective. The category of overhead allocation objective determines the basis for development of cost pools and allocation bases in step three.

Step three: Develop cost pools and allocation bases

The criteria for developing cost pools and allocation bases is determined by the objective of allocation identified in step two. If the allocation objective was determined to be a broad, easily obtainable objective, then only a few easily managed cost pools and readily available allocation bases should be chosen for overhead allocation. From the example in step two, the objective of financial reporting was categorized as broad and easily obtainable and, therefore, a few cost pools with readily available allocation bases should be developed. For example, just two cost pools, production overhead and corporate administrative costs, allocated on direct labor hours and number of personnel respectively, might be sufficient.

If the objective for overhead allocation is determined to be specific and strategic, a more in-depth development of cost pools and allocation bases is needed. Cost pools

should be developed based on cause or benefit relationships and allocation bases chosen that reflect the cause/benefit relationship. Indirect costs that do not have an apparent cause or benefit relationship should be grouped in one or more additional cost pools and allocated on the basis of equity or fairness. In the second example, the allocation objective of evaluating a profit center or product line is a specific, strategic objective and requires a more in-depth development of cost pools and allocation bases. In this case, indirect costs would first be pooled on the basis of what caused them or by factors that represent a measure of benefit resulting from them. For example, a cost pool consisting of production equipment maintenance costs and utilities might be allocated based on machine hours. Another cost pool consisting of human services, occupational safety, and worker insurance expenses might be allocated based on number of employees. All indirect costs with cause or benefit relationships would be similarly grouped in cost pools, while the remaining indirect costs, those with no apparent cause/benefit relationship, would be allocated on an equity or fairness determined allocation base. As noted previously, equity or fairness as a criterion for selecting an allocation base is inherently subjective. An allocation base should be selected that is considered fair and reasonable to all cost centers involved.

Step four: Evaluate the proposed allocation method against the desired objectives

After cost pools and allocation bases have been developed, the resulting financial information should be compared with the allocation objectives to determine if the

objectives have been met. If the objectives have not been achieved, cost pools and allocation bases should be re-worked until the desired objectives are met.

Step five: Evaluate the cost of the system against the derived benefits

Once the allocation system is achieving the objectives, the cost and effort of the allocation system should be evaluated against the benefit gained from it. If the cost and effort are considered too high, the cost pools and allocation bases should again be re-worked (in this case simplified) to reduce the difficulty of the system. Steps four and five are an on-going diagnostic process to ensure the allocation system is meeting objectives and not becoming over-burdening.

B. PROCESS SCHEMATIC

The step-by-step process of developing an overhead allocation system discussed in Part A is presented as a schematic Figure 4.1. The Overhead Allocation Process Schematic represents the process of developing an overhead allocation system in the private sector organizations studied.

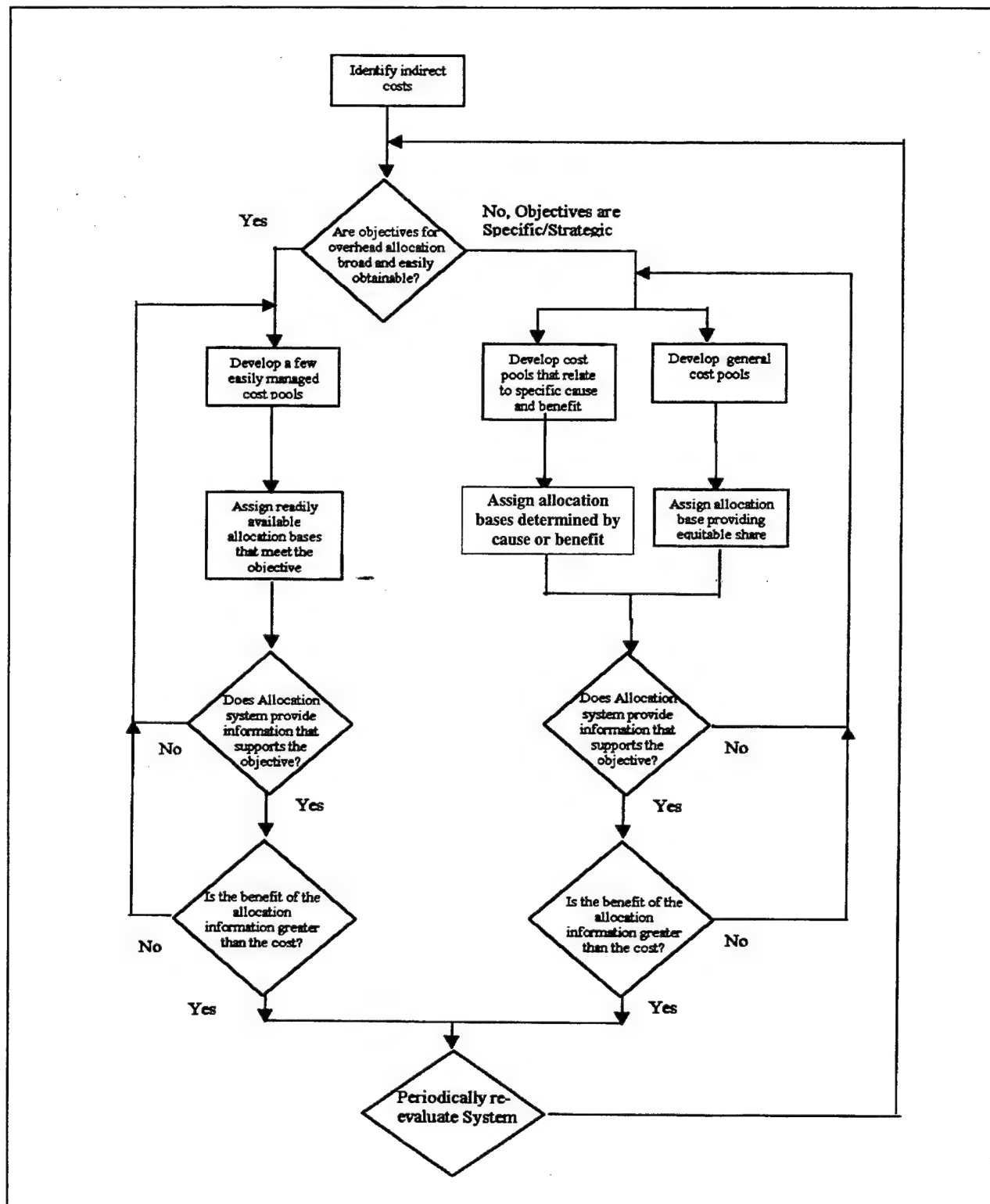


Figure 4.1 Overhead Allocation Process Schematic

C. LITERATURE REVIEW

In 1981, James M. Fremgen and Shu S. Liao published the results from a study of the indirect cost allocation practices of 123 corporations. Their study is compared to the more limited survey of five corporations in this thesis. Also, four current managerial cost accounting texts (Atkinson, et al., 1997; Cooper and Kaplan, 1999; Horngren, Foster, and Datar, 1997; Maher, 1997) are used to evaluate the consistency of the overhead allocation practices developed from private sector interviews in this study with what is found in current accounting literature.

On the importance of determining the objective for overhead allocation, Fremgen and Liao stated:

The methodology of indirect cost allocations involves two principal issues: What separate pools of indirect costs should be identified and allocated together? Over what bases should the costs in any given pool be allocated? Both of these issues depend on the objective of the allocation. For example, if the allocation is made to satisfy some broadly worded requirement, management is likely to establish only a few broad indirect cost pools and allocate them over some readily available bases. Ease and convenience are the dominant considerations. On the other hand, if management wishes to allocate costs in order to induce a particular response on the part of division managers, there are likely to be more indirect cost pools and more carefully selected allocation bases. (Fremgen and Liao, 1981, pp. 4-5)

This statement is consistent with step two in the Overhead Allocation Process Schematic developed in Parts A and B of this chapter. It also shows that the concept of the importance of establishing objectives for overhead allocation is not new, yet managers interviewed for this thesis indicate it is an area frequently overlooked or under emphasized.

Fremgen and Liao asked each corporation to list the criteria on which they determined allocation bases. Causal and beneficial factors were most frequently cited, followed by equity or fairness. This is also consistent with the answers of the managers interviewed for this thesis. However, after evaluating the allocation bases actually used by the corporations, Fremgen and Liao determined that the criterion most frequently used was actually an "ability-to-bear." This highlights a scope limitation of this thesis in that only interviews with managers were utilized as a basis for data. An analysis of the actual allocation bases was not done. It is possible that the criteria that managers say is used, may differ from the criteria actually used. This does not change the assertion that cause and benefit are the preferred criteria for determining allocation bases, only that corporations do not always succeed in implementing the criteria.

Fremgen and Liao found that 65 percent of corporations in their study reviewed their allocation practices at least annually. This supports steps four and five in the Overhead Allocation Process Schematic, which were developed based on managers' statements reflecting the importance of periodically evaluating an allocation system with respect to its objectives and cost.

The more current managerial cost accounting texts also contains indirect cost allocation concepts that are similar to those presented in the Overhead Allocation Process Schematic. The importance of developing objectives for allocation is evident throughout the literature. Maher states: "Cost information must provide the appropriate data for the intended purpose" (Maher, 1997, p. 187). According to Atkinson, et al.:

The design of an effective management accounting system should be contingent on the unique nature of the organization. A management accounting system cannot be designed in isolation from the organizational context in which it must operate and be used. (Atkinson, et al., 1997, pp. 48-49)

In selecting criteria for allocation bases, Maher (1997) lists in order of preference: 1) causal relation, 2) benefit received, and 3) reasonableness. Horngren, Foster, and Datar (1997) present this list of criteria to guide cost allocations: 1) cause and effect, 2) benefits received, 3) fairness or equity, and 4) ability to bear. Managers interviewed for this thesis also cited cause and benefit as preferred criteria, while identifying "equity" as a basis for allocation when cause or benefit cannot be established. Maher's use of "reasonableness" is very similar to the interviewed managers' description of equity. The criterion of "ability to bear" was not cited by any of the managers interviewed. However, as evident in the Fremgen and Liao (1981) study, observation of the cost allocation practices actually in use in the private sector could reveal evidence of "ability to bear" as an allocation criteria.

Step three in the Overhead Allocation Process Schematic advocates an in-depth development of cost pools and allocation bases if the objectives for allocation are specific and strategic. Cooper and Kaplan (1999) support this idea. They discuss the relationship between the number of cost drivers and the accuracy of a cost system: "When objects consume resources in different ratios, no single cost driver can accurately assign all indirect costs. In general, as more cost drivers are used in a system, the designer can develop a more accurate cost system." (Cooper and Kaplan, 1999, p. 59)

Finally, Maher argues that in the area of evaluating the cost of an allocation method: "Cost information can invariably be improved. The benefits of improvement, however, must outweigh the cost of making the improvements." (Maher, 1997, p. 187) Step five in the Overhead Allocation Process Schematic is based on this important concept.

In summary, the Fremgen and Liao (1981) study of overhead allocation in industry and current managerial cost accounting texts support the concepts developed in Parts A and B of this chapter. However, the Fremgen and Liao (1981) study documents potential differences between an organization's intentions for overhead allocation and the actual overhead allocation system.

V. PRIVATE SECTOR PROCESS APPLIED TO NAVY RDT&E ORGANIZATION

A. CHAPTER FOCUS

This chapter uses the experiences gathered from the private sector interviews and the resulting Overhead Allocation Process Schematic to evaluate the Navy's current practice for overhead allocation in NWCF activities. The Overhead Allocation Process Schematic is also applied to NAWCAD's Composite Rate Study to evaluate its compatibility with private industry practices. Finally, the Overhead Allocation Process Schematic is used to describe how a Navy overhead allocation system would be designed if based on private sector practice.

B. CURRENT NAVY ALLOCATION METHOD

As previously described in Chapter II, NWCF activities group indirect costs into two cost pools: production overhead and general and administrative (G&A) overhead. Production overhead includes expenses such as indirect materials, indirect contractual services, indirect labor, depreciation, and any other indirect expenses incurred by a production cost center. G&A overhead includes expenses such as corporate expenses, Public Works expenses, and all other general expenses incurred in a general cost center which are not identifiable to a specific job order. G&A overhead is allocated to cost centers and billed to customers based on direct government labor hours. Production overhead is pooled at the production cost center and billed to customers based also on direct government labor hours. At NAWCAD, production cost centers consist of the

the following competencies: 1.0 Program Management, 3.0 Logistics, 4.0 Research and Engineering, and 5.0 Test and Evaluation.

This current method of overhead allocation in NWCF activities can now be compared to the practices of private industry by breaking it down step-by-step following the Overhead Allocation Process Schematic developed in Chapter IV.

Step one: Identify indirect costs

NWCF activities follow the Navy Comptroller Manual's guidance that overhead costs are "those expenses not identifiable to a specific customer." (U.S. Navy Office of the Comptroller, 1990, p. 1-35) This interpretation differs somewhat from accounting literature's definition of costs that cannot be traced to a specific component of a company. (Fremgen and Liao, 1981) The different interpretation is reflected in different phases of the allocation process. In the first phase, allocations are made from one organizational unit to another (e.g., from headquarters to a division). That is the phase that Fremgen and Liao studied. Then all indirect costs in the final production unit (including those allocated to it from higher units) are allocated to output (e.g., customer jobs). This distinction is important and will be further discussed in Part D of this chapter. NWCF activities identify costs that cannot be traced to a specific customer and classify these costs as either G&A overhead or production overhead, depending on whether the cost originates in a General Cost Center (e.g., NAWCAD competencies 2.0, 7.0, 8.0) or a Production Cost Center (e.g., NAWCAD competencies 1.0, 3.0, 4.0, 5.0).

Step two: Identify objectives for overhead allocation

The current system of rate formulation in NWCF organizations has only one objective of overhead allocation: to recover all overhead expenses through rates charged to customers. This is certainly a broad and easily obtainable objective. Whether this objective sufficiently fulfills the requirements of Navy managers is questionable, and is subsequently addressed in this thesis. However, in the evaluation of the current Navy system, the recovery of all overhead expenses is the only overhead allocation objective that is discussed in the governing regulations.

Step three: Develop cost pools and allocation bases

A broad, easily identifiable objective for overhead allocation was identified in step two. Based on this assessment, the Overhead Allocation Process Schematic prescribes development of a few easily managed cost pools and assignment of readily available allocation bases. As detailed previously, current Navy practice utilizes two broad cost pools (G&A and production overhead) and allocates them with a readily available allocation base (direct government labor hours). The cost pools and allocation bases are consistent with the stated objective of overhead allocation.

Step four: Evaluate the proposed allocation method against the desired objectives

Financial data for NAWCAD in FY98 suggest the current method for allocating overhead in NWCF activities is capable of achieving the objective of recovering all overhead costs through customer billing. In FY98 revenue generated from customer

billing exceeded NAWCAD expenses, resulting in a positive Net Operating Result (NOR). (Runion, 1998) The current system for overhead allocation obviously requires accurate estimations for anticipated direct labor hours to be applied to customers and anticipated overhead expenses in order to set proper billing rates. Previous years have seen negative NOR's at NAWCAD due to inaccurate estimates. (Runion 1998) With accurate overhead cost and applied direct labor hour estimates, the current system supports the objective.

Step five: Evaluate the cost of the system against the derived benefits

Since the current allocation method has been evaluated to meet the stated objectives, the final step in the Overhead Allocation Process Schematic is to determine if the cost and effort in implementing the system is worth the derived benefits. Because the current system of allocation is relatively simple and the resulting benefit of recovering all costs is critical, it follows that the benefits of the system outweigh the costs.

C. COMPOSITE RATE STUDY

As discussed in Chapter II, NAWCAD's Composite Rate Study was developed from a growing belief that NAWCAD customers are being charged disproportionate amounts of overhead depending on the amount of government labor or contract labor that is used on a customer's program. Recall that overhead is allocated solely on government labor hours, while contract labor hours carry no overhead burden. Authors of the Composite Rate Study propose the development of three overhead cost pools, one of

which is subsequently allocated based on both government and contractor direct labor hours. (NAWCAD, 1998) The Overhead Allocation Process Schematic can be applied to the Composite Rate Study to evaluate its consistency with private industry practices.

Step one: Identify indirect costs

The identification of indirect costs in the Composite Rate Study does not differ from the current NWCF system. Indirect costs are identified as all costs that cannot be attributed to a specific customer. (NAWCAD, 1998)

Step two: Identify objectives for overhead allocation

The Composite Rate Study introduces an additional objective for overhead allocation to the existing objective of recovering all costs from customer billing. This additional objective is equitable distribution of overhead costs charged to customers through customer billing. This raises a question of whether or not the overhead allocation objectives should now be considered specific and strategic. While the answer to this question is purely subjective, adding an additional objective certainly moves the over-all objective towards being specific and strategic relative to the broad, easily obtainable objective of the current system.

Step three: Develop cost pools and allocation bases

If the objective of overhead allocation in the Composite Rate Study is more specific than that of the current system, using the Overhead Allocation Model as the baseline, we would expect more in-depth development of cost pools and allocation bases.

As described in Chapter II, the Composite Rate Study proposes grouping indirect costs into three overhead cost pools (as compared to two cost pools in the current system). Two of the three cost pools, government indirect costs and occupancy costs were developed based on NAWCAD management's assessment of what caused these costs. For example, all of the overhead costs grouped under "government indirect costs" were evaluated to have a causal relationship with government workers only, while those grouped under "occupancy costs" were evaluated to have a causal relationship with all workers (contract and government). Costs grouped under "general and administrative" were evaluated to have no causal relationship with workers. There is no indication that the authors of the Composite Rate study attempted to identify other causal bases for costs in the "general and administrative" pool. The allocation bases used to allocate costs grouped in the cost pools remain relatively broad, using readily available bases. The "government indirect cost pool" and "occupancy cost pool" use direct labor hours as an allocation base, while the "general and administrative cost pool" uses total cost other than G&A as a base.

Step four: Evaluate the proposed allocation method against the desired objectives

Since the Composite Rate Study is still in the proposal stage, there are no financial data available to determine if the allocation method is meeting the objectives. However, it is possible to discuss the criteria that should be used to evaluate its success. First, it must accomplish the original objective of recovering all costs through customer billing. This will be readily apparent from a break-even or positive Net Operating Result.

Second, it must produce an equitable distribution of overhead costs to customers through billing. This objective is more difficult to evaluate. The meaning of "equitable distribution" depends somewhat on the subjective evaluation of customers. Based on the experience of the private sector, developing a causal relationship in allocating overhead should produce a more equitable distribution of costs.

Step five: Evaluate the cost of the system against the derived benefit

Again, because the Composite Rate Study is still in the proposal stage, the cost of the system can only be estimated. Since the cost pools and allocation bases are not particularly complicated, the cost and effort of implementing the new system would probably not be much greater than the cost of the current system.

D. NAVY SYSTEM BASED ON PRIVATE SECTOR PRACTICE

The preceding sections used the Overhead Allocation Process Schematic to evaluate both the current NWCF overhead allocation method and the method proposed in NAWCAD's Composite Rate Study. Next, the Overhead Allocation Process Schematic is used to develop an allocation method for NAWCAD that best reflects the practices and experiences of the private sector organizations studied.

Step one: Identify indirect costs

The identification of indirect costs in a private industry-based system is slightly different from the current Navy system and the Composite Rate Study, due to the

different interpretation of what indirect costs are. Using the private industry definition of costs that cannot be traced to a specific component of a company, some costs previously considered indirect (because they could not be traced to a specific customer) may now be considered direct (at least at a specific level in the organization). For example, some production costs in a lower-level sub-competency laboratory may not be traceable to a specific customer, but can be traced to the specific laboratory. The current Navy allocation method would treat these costs as production overhead and pool them at the competency level. Private industry practice, on the other hand, would treat these costs as direct costs to the specific laboratory. Operating under an allocation system built from the private sector, NWCF activities must then allocate these production costs to customers through billing. In this case, only customers using the specific laboratory would incur these costs. The net result is that production overhead is pooled at the lowest sub-competency level where costs occur. This method would result in a different production overhead rate for each sub-competency, as opposed to a competency-wide production overhead rate in the current system. The identification of general and administrative overhead would not change from that of the current system.

Step two: Identify objectives for overhead allocation

In the private sector interviews, managers stressed that the identification of objectives for allocating overhead is critical to developing a system that produces the desired results. In applying the Overhead Allocation Process Schematic to the current Navy system, it appeared that overhead cost pools and allocation bases were consistent

with the stated objective. Still, NAWCAD managers have stated that the current Navy allocation method is not producing desired results and is not consistent with private industry practice. The problem with the current system is in the identification of objectives for overhead allocation.

While only the leaders in the Navy Working Capital Fund organization can determine what the objectives for overhead allocation ultimately should be, some key elements for developing the over-all objective can be surmised from sources previously discussed. First, the current objective of recovering all costs through customer billing is a basic requirement and must remain part of the new objective. (U.S. Navy Office of the Comptroller, 1990) Second, the need for equitable distribution of overhead costs in customer billing was the motivation behind NAWCAD's Composite Rate Study, and should also be a part of the new objective. (NAWCAD, 1998) Finally, in keeping with the Defense Reform Initiative's challenge of making DOD business organizations leaner and more flexible, Navy managers need data that better reflect cost relationships. (Cohen, 1999) This last requirement can be translated into the overhead allocation objective of evaluating the performance of cost centers and identifying areas for cost cutting.

Step three: Develop cost pools and allocation bases

In step two, the objectives for overhead allocation were identified as: 1) to recover all costs through customer billing, 2) to ensure equitable distribution of overhead in customer billing, 3) to evaluate the performance of cost centers, and 4) to identify areas for cost cutting. Relative to the current Navy system, these new objectives are very

specific and strategic. Based on specific, strategic objectives, the Overhead Allocation Process Schematic calls for the development of cost pools and allocation bases determined by cause and benefit. All indirect costs that cannot be pooled and allocated based on cause or benefit should be grouped in a general cost pool and allocated on a base that provides equity or fairness to cost centers and customers.

As discussed in step one, production overhead should be pooled at the lowest sub-competency level (where the costs actually occur). These indirect production costs should then be developed into customer billing rates determined by a cause or benefit driver. For example, machine maintenance costs and equipment depreciation would be pooled in the laboratory or sub-competency in which they occur and allocated to customers based on machine hour usage. Production overhead that is common across more than one sub-competency would be first allocated to the individual sub-competencies based on a cause or benefit driver, then developed as a specific sub-competency billing rate. General and administrative overhead should be grouped into cost pools that can be allocated to competencies (and further allocated to sub-competencies) based on cause or benefit drivers. For example, Public Works and Physical Security costs could be pooled and allocated based on building square footage.⁴ All G&A overhead that has no readily identifiable cause or benefit driver should be pooled and allocated to competencies based on equity or fairness (head-count, equal share, etc.). Once allocated, sub-competencies would recover the G&A overhead through

⁴ Additional investigation may indicate an allocation base that better represents the cause or benefit relationship than building square footage.

customer billing. Again, this would result in a different G&A rate in each sub-competency, depending on the cost drivers. An allocation method for G&A overhead that incorporates cause and benefit drivers, as described above, produces incentive for competency managers to reduce unneeded (non-value added) activities that produce G&A costs. This cost-efficiency incentive in G&A allocation is not found in either the current Navy system or the system described in the Composite Rate Study.

The fundamental difference between this allocation method based on private industry and the system currently employed by the Navy is a decentralization of customer billing rate formulation. A Navy system based on private industry would allocate overhead costs based on cause or benefit to the lowest practicable cost center, then allow these cost centers to develop individual billing rates to recover total costs. As described earlier, the current system at NAWCAD uses an organization-wide rate for G&A overhead and a competency-wide rate for production overhead.

Step four: Evaluate the proposed allocation method against the desired objectives

After the cost pools and allocation bases have been developed, they should support the objectives identified in step two. Because there are multiple allocation objectives, evaluating the allocation method against the objectives may require adjustments in the system to balance priorities in the objectives. Navy Working Capital Fund managers and customers should provide the critical evaluation to ensure objectives are met.

Step five: Evaluate the cost of the system against the derived benefit

Evaluating the cost of the system against the derived benefits is a key step in this proposal. The overhead allocation method developed based on private industry practices will be much more involved than the current system and may require considerably more time and effort to manage. Trade-offs may need to be made between the number of cost pools and allocation bases and the cost of the system.

Another major factor that must be evaluated as a cost of the system is its compatibility with the needs of the customer. The current system of overhead allocation in NWCF organizations enables stabilized billing rates that facilitate budgeting for customers. A new system that decentralizes rate formulation and allocates overhead on a number of cost drivers other than direct labor hours must also accommodate accurate budgeting information for customers. In order for such a system to work, financial managers at the sub-competency level must convert indirect costs from multiple cost pools and drivers into an understandable billing rate for customers.

Figure 5.1 is an illustration of overhead cost pools at descending levels in the NAWCAD organizational structure for both the current Navy system and for a system based on the private sector. The system based on the private sector decentralizes billing rate formulation, placing production overhead pools at lower sub-competency levels, and creates multiple cost drivers to allocate G&A overhead to cost centers.

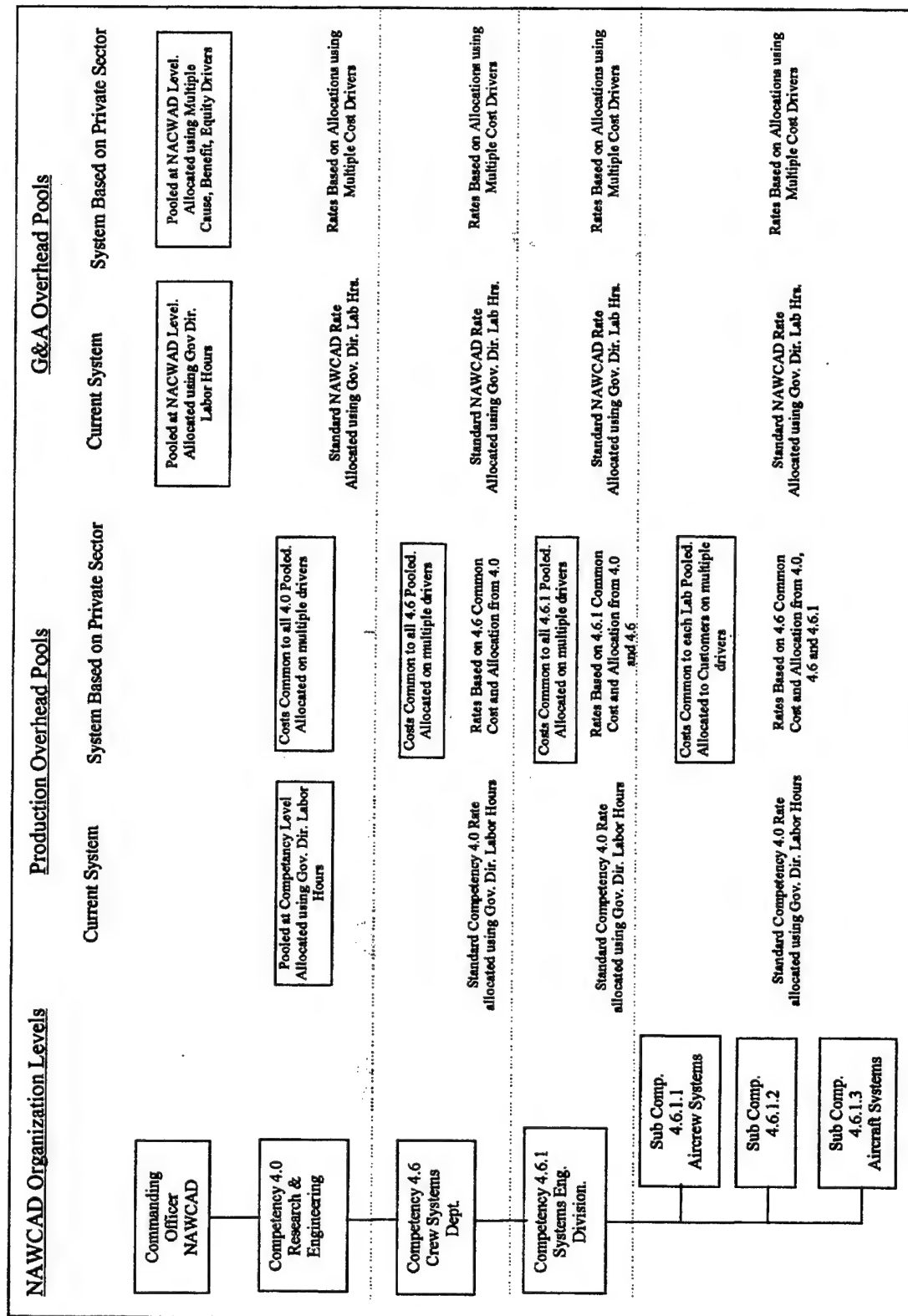


Figure 5.1 Illustration of Overhead Cost Pools

VI. ANALYSIS AND FINDINGS

A. ANALYSIS

After developing a private sector overhead allocation process and applying it to the Navy's current practices and to NAWCAD's Composite Rate Study, some general observations can be made.

1. The stated objective for overhead allocation in Navy Working Capital Fund activities is very straightforward: to recover all costs through customer billing. Based on the lessons of private industry, the first thing that should be done in considering changes to the current system is to determine what new objectives for allocation are desired.

2. In order to change the objectives and ultimately the allocation method, Navy governing regulations must be changed. The Navy Comptroller Manual, Volume 5, states that "overhead costs will be applied to jobs by using predetermined overhead rates based on total civilian and military direct labor hours." It also states that "overhead rates are designed to recover all overhead expenses financed by the industrial fund activity for work performed for all customers." (U.S. Navy Office of the Comptroller, 1990, p. 2-31)

In order to expand the objectives for overhead allocation to include the need for better cost data to evaluate cost centers and reduce costs, there needs to be more flexibility in the regulations.

3. A Navy overhead allocation system developed from private industry practice, as discussed in Chapter V, Section D of this thesis, would require a decentralization of customer billing development down to the sub-competency level. To do this would

involve two fundamental changes from the current system. First, production overhead would remain at the lowest cost center where the costs occur (the lowest level where the costs are common to more than one customer). Second, overhead would be developed into cost pools and allocated based on cause or benefit to the sub-competency before billing rates are then formulated in the sub-competency.

4. The challenge of developing a Navy overhead allocation method based on private industry practice is adapting it to satisfy customer needs. Customers of NAWCAD are, for the most part, Navy program managers for various aircraft systems. An overhead allocation method that produces different billing rates in every sub-competency must also provide Program Managers with the data necessary to develop annual budgets.

B. FINDINGS

The following findings were developed after studying DOD and Navy business practices and regulations and comparing them with private sector practices.

1. The objectives and procedures for overhead allocation, currently used in Navy Working Capital Fund activities, do not facilitate changes called for in the Defense Reform Initiative and in the Secretary of Defense's 1999 Report to the President and Congress. As discussed in Part A above, the NAVCOMPT Manual specifies the use of government direct labor hours for the application of overhead costs and identifies the recovery of all overhead expenses as the sole objective of overhead rates. In the Defense Reform Initiative, Secretary of Defense William Cohen made the following statement with regard to the Defense Working Capital Fund (DWCF):

The Department has made dramatic changes to DWCF operations over the past eight years in an effort to achieve a more business-like, buyer-seller relationship. Despite these changes, numerous opportunities remain for improvement of management and business operations. Given the size of the DWCF, even modest increases in efficiency to DWCF operations could produce significant benefits and provide savings to enable additional modernization. (Cohen, 1999, p. 142)

In his 1999 Annual Report to the President and Congress, Secretary Cohen outlined twelve goals for acquisition reform. Goal 10 is directly relevant to this thesis:

Providing improved visibility of total ownership costs. Define requirements and establish an implementation plan for a cost accounting system that provides routine visibility into weapon system life-cycle costs through activity-based costing and management. The system must deliver timely, integrated data for management purposes to: permit understanding of total weapon costs; provide a basis for estimating costs of future systems; and feed other tools for life cycle cost management. (Cohen, 1999, p. 160)

The regulations for overhead allocation and billing rate formulation contained in the NAVCOMPTMAN do not provide the flexibility for Navy managers to design allocation systems that achieve the results that the Secretary of Defense has called for.

2. The current system for overhead allocation in Navy Working Capital Fund activities does not facilitate the presentation of cost data in a manner that best represents cost relationships. For instance, at NAWCAD, production overhead is pooled at the competency level and billed to customers based on government direct labor hours. An overhead allocation system that uses only one broad cost driver cannot reflect the same degree of accuracy in cost reporting as a system that pools overhead at the lowest common cost center and uses multiple cost drivers reflecting cause and benefit

relationships. Likewise, G&A overhead is pooled at the NAWCAD organization level and charged to customers based on government direct labor hours. Again, a system using multiple cost drivers for G&A costs that have cause and benefit relationships would provide more accurate data.

3. The proposed allocation method in NAWCAD's Composite Rate Study is an improvement on the current system. The Composite Rate Study proposes two indirect cost pools that are developed based on causal factors associated with government workers and both government and non-government occupants. The third cost pool contains general expenses, and is allocated on a non-causal base. This allocation method moves closer to private sector allocation practice and is more in line with the reforms advocated by Secretary Cohen. While there is potential to develop an allocation method that even better utilizes cost pools and allocation bases that reflect cause and benefit relationships, the Composite Rate Study presents an opportunity to establish the viability of a more "business" type system in a NWCF environment.

VII. CONCLUDING COMMENTS

A. SUMMARY

The Defense Reform Initiative challenges Department of Defense organizations to adopt those business practices that American industry has successfully used to become leaner and more flexible. This thesis has used the practices and experiences of five leading private sector organizations to develop a process for overhead allocation that can be used to evaluate and possibly improve the overhead allocation practices in Navy business organizations.

The present method for allocating overhead and developing customer billing rates in Navy Working Capital Fund activities appeared to be consistent with private industry practices when evaluated in conjunction with the objectives for overhead allocation stated in governing regulations. However, the emphasis on operating more efficiently and the reality of operating with a relatively smaller budget suggest that the overhead allocation objectives for DOD business organizations should be expanded to provide managers performance data that better reflect cost relationships in their work centers. This thesis supports NAWCAD's Composite Rate Study as being a movement towards adopting private industry's practice of trying to associate cause and benefit in the development of allocation bases. The proposed allocation method should result in a more equitable system for billing customers.

There is potential to move even closer towards private industry practice by expanding cost pools and allocation bases determined by cause and benefit relationships.

The resulting system may require a decentralization of the process for developing customer billing rates and probably would have to be tempered by the amount of work required to manage it. Any new system developed must also provide customers predictable billing information that can be incorporated in annual budgeting.

B. RESEARCH QUESTIONS

1. Can the method for allocating overhead costs in a Navy RDT&E organization be improved by studying the practices of the private sector? Adopting an allocation method based more closely on the practice of private industry has the potential to provide Navy managers with cost data that more accurately reflect the performance of their cost centers and can be more reliably used to make financial decisions. Based on this study of private sector organizations, NAWCAD's Composite Rate Study proposes an allocation method that more accurately represents cost relationships and potential exists for even more improvement.

2. Are there commonalties in the overhead allocation practices of private industry that can be developed into a common private sector process? Interviews with private sector managers revealed overhead allocation practices that are detailed in Chapter Three. These common practices can be summarized in the following general terms.

1) The foundation of an effective overhead allocation system is first establishing an organization's objectives for overhead allocation.

2) If an organization's objective for overhead allocation is broad and relatively non-specific, a few indirect cost pools allocated on one or two readily available bases will suffice. If an organization has specific, strategic objectives for overhead allocation, multiple cost pools and allocation bases are needed.

3) The preferred criteria for determining allocation bases are cause and benefit. Indirect costs that have no apparent cause or benefit relationship should be allocated on a base that reflects equity or fairness.

4) Allocation methods should be periodically reviewed to ensure that the allocation process is producing an output that meets the objectives and that the benefits of the allocation system outweigh the cost of managing it. In Chapter Four the allocation process developed from the private sector is presented in Figure 4.1.

3. Can a private industry practice be applied to Navy RDT&E organizations? Analysis in Chapter V indicates that the practice of overhead allocation in private industry can be applied to Navy RDT&E organizations. In order to incorporate private industry practices, Navy business organizations would have to decentralize their rate formulation process by using cause and benefit drivers to allocate overhead down to the lowest feasible sub-competency level, then allow sub-competencies to develop individual customer rates. A decentralized rate development system based on the overhead allocation practice of private industry would provide Navy managers more accurate cost data for evaluating the profitability of their laboratories and a better understanding of cost relationships.

4. What potential problems might result from incorporating an allocation method that is developed from private industry? Two potential problems have been identified in this thesis that could result from adopting a private sector overhead allocation method in Navy business organizations. First, customers of Navy business organizations require stabilized billing rates in order to develop annual budgets. There is potential that an allocation method that produces different billing rates for each individual sub-competency could make budgeting too difficult for customers. To avoid this problem, sub-competencies would have to develop accurate, stabilized rates and ensure usage and billing estimates are available for customer programs to support annual budgeting. The second potential problem with adopting an allocation system based on private industry is the potential cost and effort of implementing and managing such a system. Whether or not the benefits resulting from a new overhead allocation system are worth the cost and effort associated with it depends on how the resulting information is used. If more accurate cost data are used to make better decisions regarding the elimination or out-sourcing of under-performing laboratories and to better assess the source of costs, the new system may be worth the price.

C. SUGGESTIONS FOR FURTHER RESEARCH

Based on the research and findings of this thesis, the following recommendations for further research are offered to further explore the possibility of improving overhead allocation in Navy RDT&E organizations.

1. A recurring theme from the interviews with private sector financial managers was the importance of identifying the objectives of overhead allocation before deciding on an allocation method. Current regulations governing the method of overhead allocation in Navy Working Capital Fund activities outline only the basic objective of recovering all costs through customer billing. Before changes are made to the current Navy allocation system, new objectives should be defined. A possible method for defining new objectives is convening a focus group of Navy leaders with a charter of developing specific overhead allocation objectives from which an allocation method could be built.
2. A benchmarking study is recommended in order to develop a best business practice for overhead allocation in comparable private sector organizations. This thesis was limited to five private sector organizations that were available under time and resource constraints. The private sector practices discussed and the overhead allocation process developed are representative of the organizations studied but may not have captured best practice.
3. This thesis focused on developing a process that represents the method for overhead allocation in private industry and discussed, in general terms, how a Navy system could be developed based on this process. Further research is recommended that would develop a "prototype" overhead allocation model at NAWCAD that utilizes a decentralized rate formulation process based on private industry.

**APPENDIX A. INFORMAL INTERVIEW WRITTEN RESPONSES –
COMPANY A**

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: Twenty-five percent.

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: Yes, all G&A costs are allocated to cost centers.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: Allocation bases are determined by cause when possible. General costs that have no causal relationship are allocated on an equity basis. (Company A did not list actual allocation bases.)

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: Yes, outside source is permitted.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: Generally low price wins. As a basis for in-house price, sometimes a fully-burdened cost is used, sometimes a "fixed plus variable cost" is used.

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: Contract labor does not carry the same overhead burden as contractors. Only costs that are deemed to be caused by contractors are allocated.

**APPENDIX B. INFORMAL INTERVIEW WRITTEN RESPONSES –
COMPANY B**

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: Eleven percent.

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: Yes, all are allocated.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: Allocation bases are chosen based on cause and affect. Some examples: Buildings and Grounds – allocated on square feet, Pension – allocated on head count, Various Support Costs – allocated based on usage.

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: Yes.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: Inside purchases are encouraged, but no artificial means are used.

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: No overhead burden assessed to contractors.

**APPENDIX C. INFORMAL INTERVIEW WRITTEN RESPONSES –
COMPANY C**

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: About ten percent.

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: Yes, all are allocated.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: Allocation bases determined by cause are utilized for all costs that have a causal relationship. All others are allocated on head count.

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: Yes, outside buying is being done.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: Make or buy decisions are not based solely on price. Other factors considered are: quality, risk, and potential future vulnerability.

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: Some overhead is allocated to contractors based on head count.

**APPENDIX D. INFORMAL INTERVIEW WRITTEN RESPONSES –
COMPANY D**

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: Ten to fifteen percent.

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: Yes, all are allocated.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: Bases determined by cause and benefit.

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: Generally yes. It depends on the total expected result of the decision to outsource.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: Not based on price only. (see answer to question four)

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: Contract labor does not carry the same overhead burden. It depends on cause and benefit.

**APPENDIX E. INFORMAL INTERVIEW WRITTEN RESPONSES –
COMPANY E**

Question #1: Approximately what percentage of your company's (or companies' for which you consult) total costs are corporate G&A overhead?

Answer: Approximately fifteen percent.

Question #2: Does your company (or do companies for which you consult) allocate any part of these G&A costs among profit centers?

Answer: All G&A overhead costs are allocated.

Question #3: What allocation base (or bases) is used, either fully or in part, to allocate overhead to profit centers?

Answer: We have a number of different allocation bases for costs that have a causal relationship. For costs that have no causal base, we use head count.

Question #4: Concerning make or buy policy, is obtaining goods or services from an outside source permitted when they are available from within the corporation?

Answer: Yes, out-sourcing is permitted.

Question #5: Are make or buy decisions based solely on competitive pricing or are artificial means used to encourage exchange within the company?

Answer: Make or buy decisions are not based solely on price. Many other non-financial factors are considered.

Question #6: Does contract labor, such as engineers and programmers, carry the same overhead burden as permanent employees of the organization?

Answer: A reduced amount of overhead is allocated to contractors (depending on causal allocation bases).

LIST OF REFERENCES

Atkinson, A., Banker, R., Kaplan, R., and Young, S. (1997). *Management Accounting*, Second Edition. New Jersey: Prentice Hall.

Cohen, William S. (1999). United States Secretary of Defense. *Annual Report to the President and the Congress*. Washington, D.C.: Office of the Secretary of Defense.

Cohen, William S. (1997). United States Secretary of Defense. *Defense Reform Initiative: The Business Strategy for Defense for the 21st Century* (November 1997). Washington, D.C.: Office of the Secretary of Defense.

Cooper, R. and Kaplan, R. (1999). *The Design of Cost Management Systems*, Second Edition. New Jersey: Prentice Hall.

Dean, M. (1999). Conversation with Ms. Marie Dean of the Naval Air Systems Command, NAWCAD Comptroller's Office (March 1999).

Dyer, Joseph W., RADM (1999). Commander Naval Air Warfare Center Aircraft Division. *Naval Air Warfare Center Aircraft Division (NAWCAD) Internet World Wide Web Page*. Internet World Wide Web address, <http://www.nawcad.navy.mil> (March, 1999)

Fremgen, J. and Liao, S. (1981). *The Allocation of Corporate Indirect Costs*. New York: National Association of Accountants.

Haupt, J. (1998). *RDT&E Laboratory Capacity Utilization And Productivity Measurement Methods For Financial Decision Making Within DOD*. Master's Thesis, Naval Postgraduate School, Monterey, California, June 1998.

Horngren, C., Foster, G., and Datar, S. (1997). *Cost Accounting, A Managerial Emphasis*. New Jersey: Prentice Hall.

Lockard, John A., VADM (1999). Commander Naval Air Systems Command. *Commander Naval Systems Command Internet World Wide Web Page*. Internet World Wide Web address, <http://www.navair.navy.mil> (March 1999).

Maher, M. (1997). *Cost Accounting: Creating Value for Management*, Fifth edition. Chicago: McGraw-Hill.

Naval Air Warfare Center Aircraft Division (NAWCAD) (1999). "00/01 Biennial Budget," Executive summary of NAWCAD's 00/01 President's Budget Submission, January, 1999.

Naval Air Warfare Center Aircraft Division (NAWCAD) (1998). "Composite Rate Study," Status brief to the Commanding Officer, 2 September 1998.

Naval Aviation Systems Team (1998). "Navy Working Capital Fund," Brief given to NAWCAD managers, August 1998.

Runion, R. (1998). Conversation with Mr. Ron Runion of the Naval Air Systems Command, NAWCAD Comptroller (November, 1998).

U.S. Navy Department. Office of the Comptroller (1990). Navy and Marine Corps Industrial Funds. (NavCompt Manual; V.5). Washington D.C.: Department of the Navy.

105th Congress 1st Session (1997). Congressional Quarterly Almanac 1997 Volume LIII. Washington, D.C.: Congressional Quarterly Inc.

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